

(19)



Europäische Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 692 201 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.09.1999 Bulletin 1999/36

(51) Int. Cl.⁶: **A24C 5/35**

(21) Application number: **95108992.9**

(22) Date of filing: **12.06.1995**

(54) Method of and apparatus for converting a single layer of rod-shaped articles into a mass flow

Verfahren und Einrichtung zur Umsetzung einer Schicht von stabförmigen Gegenständen in einen Massenstrom

Procédé et appareil pour convertir une seule couche d'articles en forme de tige en un courant de plusieurs couches

(84) Designated Contracting States:
AT BE CH DE ES FR GB IT LI NL SE

(30) Priority: **14.07.1994 US 274968**

(43) Date of publication of application:
17.01.1996 Bulletin 1996/03

(73) Proprietor:
**Hauni Maschinenbau Aktiengesellschaft
21033 Hamburg (DE)**

(72) Inventors:
• **Hoffmann, Wilfried**
Richmond, Virginia 23236 (US)
• **Sanmann, Gerd**
Sandston, Virginia 23150 (US)
• **Foerster, Joerg**
Richmond, Virginia 23231 (US)
• **Trenkner, Peter**
Richmond, Virginia 23231 (US)

(56) References cited:
FR-A- 2 318 787 **GB-A- 2 051 552**
US-A- 4 938 340

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 692 201 B1

Description

[0001] The invention relates to improvements in methods of and in apparatus for manipulating rod-shaped articles, such as plain or filter cigarettes, cigars or cigarillos, filter rod sections and/or other rod-shaped articles of the tobacco processing industry. More particularly, the invention relates to improvements in methods of and in apparatus for converting a single layer of spaced-apart parallel elongated rod-shaped articles which are advanced sideways (transversely of their length) into a mass flow containing two or more superimposed layers of parallel articles. The articles of the mass flow can be arrayed in a so-called quincuncial formation.

[0002] U.S. Pat. No. 4,938,340 granted July 3, 1990 to Horsley et al. for "Conveying rod-like articles" discloses an apparatus wherein a rotary conveyor delivers a series of successive rod-shaped articles sideways into the relatively narrow inlet of a channel defined by one or more upper endless belt conveyors and one or more lower endless belt conveyors. The width of the channel increases in a direction away from the rotary conveyor so that the articles in the channel can start the formation of a flow wherein some of the articles are contacted by the upper conveyor(s) and the remaining articles are contacted by the lower conveyor(s). The belt conveyors are driven at a speed such that the width of the spaces between successive articles of the single layer is reduced to zero not later than at the discharge end of the aforementioned channel. The latter discharges two superimposed layers of articles into the upper end of a divergent chute which slopes downwardly toward the receiving end of the upper reach of an endless belt conveyor serving to advance a multi-layer mass flow of articles to a filter assembling machine. The chute includes walls which contact the articles of the top layer as well as the articles of the bottom layer.

[0003] The patentees propose to accelerate successive articles which leave the rotary conveyor in order to avoid damage from following articles.

[0004] Acceleration of articles above the speed which is imparted thereto by the rotary conveyor is likely to result in damage to the articles. Furthermore, each and every article in the aforementioned channel is contacted by at least one belt, and the outer layers of articles in the divergent chute are contacted by fixed parts including a strip of semiflexible material and a so-called deadplate. All this is likely to affect the appearance and/or other desirable characteristics of the conveyed articles.

OBJECTS OF THE INVENTION

[0005] An object of the invention is to provide a novel and improved method of converting a single layer of rod-shaped articles into a mass flow of two or more superimposed layers of articles.

[0006] Another object of the invention is to provide a

method which ensures the formation of a homogeneous mass flow of rod-shaped articles.

[0007] A further object of the invention is to provide a method which ensures gentle treatment of rod-shaped articles which form the single layer and which form the mass flow as well of articles which advance from the path for the single layer toward the path for the mass flow.

[0008] An additional object of the invention is to provide a novel and improved method of converting a single layer of spaced apart rod-shaped articles of the tobacco processing industry into a mass flow of two or more superimposed layers.

[0009] Still another object of the invention is to provide a novel and improved apparatus for the practice of the above outlined method.

[0010] A further object of the invention is to provide the apparatus with novel and improved means for converting a single layer of spaced apart rod-shaped articles into a mass flow.

[0011] Another object of the invention is to provide the above outlined apparatus with novel and improved means for reducing the kinetic energy of rod-shaped articles between the path for the single layer and the path for the mass flow.

[0012] An additional object of the invention is to provide the above outlined apparatus with novel and improved means for defining or establishing paths for advancement of rod-shaped articles away from the path for a single layer of articles.

[0013] Still another object of the invention is to provide a machine which embodies or which cooperates with the above outlined apparatus.

SUMMARY OF THE INVENTION

[0014] One feature of the present invention resides in the provision of an apparatus for converting a series of successive discrete elongated articles (such as rod-shaped articles of the tobacco processing industry) into a multiple-layer mass flow of superimposed articles. The improved apparatus comprises a first conveyor having means for advancing successive articles of the series transversely of their length (i.e., sideways) along a first path toward a transfer station, means for diverting successive pluralities of articles (e.g., successive groups each of which comprises three articles) of the series arriving at the transfer station into a plurality of different second paths, means for intercepting successive pluralities of diverted articles including an at least partially concave surface extending across one or more second paths and establishing (either alone or in combination with at least one other component of the apparatus) a collecting chamber wherein the intercepted articles gather next to and are superimposed upon each other, and at least one second conveyor having means for withdrawing from the chamber an at least substantially continuous flow of superimposed articles.

[0015] The first conveyor can constitute or resemble a drum which is rotatable about an axis extending in at least substantial parallelism with the articles in the first path. The advancing means can include an array of receptacles (e.g., in the form of flutes machined into or otherwise formed in the peripheral surface of the drum) which circulate about the axis of the first conveyor along the first path in response to rotation of the first conveyor. The first path is or can be a partly circular path and at least one of the plurality of different second paths is or can be at least substantially tangential to the partly circular path.

[0016] The diverting means can include means for expelling successive pluralities of articles from the first path into the plurality of different second paths. The expelling means is or can be connected to (e.g., made of one piece with) the intercepting means. It is possible to provide the diverting means with a convex surface which merges gradually into the at least partially concave surface.

[0017] The apparatus can comprise pneumatic means and/or mechanical means for attracting or for urging the articles of the series of articles to or against the advancing means along the first path.

[0018] The withdrawing means of the at least one second conveyor can comprise at least one endless flexible element (e.g., a belt or chain) having an elongated reach which carries the flow of superimposed articles leaving the collecting chamber.

[0019] The first conveyor can be disposed at a first level, and the collecting chamber can be disposed at a second level below the first level. The withdrawing means is preferably disposed at a third level at least close to the second level.

[0020] The apparatus preferably further comprises a variable-speed prime mover (e.g., an electric motor) for the at least one second conveyor, means for monitoring the frequency of advancement of successive articles of the series along a selected portion of the first path, and means for varying the speed of the prime mover as a function of the monitored frequency.

[0021] The at least one partially concave surface can constitute a friction surface which decelerates (i.e., reduces the kinetic energy of) successive pluralities of articles on their way into the collecting chamber.

[0022] The apparatus can also comprise means for monitoring the height of the flow of superimposed articles on the at least one second conveyor.

[0023] The first conveyor can be provided with a convex surface which extends along the first path, and the diverting means can be provided with a surface which is disposed at the transfer station and establishes for successive pluralities of articles a further path merging into the first path as well as into a path which is defined by the at least partially concave surface.

[0024] The advancing means can include suction ports which are provided on the first conveyor.

[0025] Another feature of the invention resides in the

provision of a method of converting a series of successive discrete elongated rod-shaped articles into a mass flow of superimposed layers of articles. The method comprises the steps of advancing successive articles of the series transversely of their length along a first path toward a transfer station, diverting successive pluralities of articles of the series from the first path into a plurality of different second paths, intercepting successive pluralities of diverted articles including positioning an at least partially concave surface across at least one of the second paths, gathering successive intercepted articles into a supply of superimposed articles, and drawing a continuous mass flow of superimposed articles from the supply.

[0026] The first path can include a substantially circular portion and at least one of the plurality of different second paths is or can be at least substantially tangential to the substantially circular portion of the first path.

[0027] The second paths are preferably oriented or distributed in such a way that they deliver articles to different portions of the supply.

[0028] The at least partially concave surface is positioned and configured to reduce the kinetic energy of articles arriving along at least one second path. For example, the kinetic energy of articles arriving along the at least one second path can be reduced as a result of frictional engagement with the at least partially concave surface.

[0029] The articles can constitute rod-shaped articles of the tobacco processing industry such as plain or filter cigarettes, cigars or cigarillos and/or filter rod sections.

[0030] The first path preferably slopes downwardly at the transfer station, the second paths can slope downwardly toward the at least partially concave surface, and the at least partially concave surface can slope downwardly toward the supply of superimposed articles.

[0031] The novel features which are considered as characteristic of the method and apparatus are set forth in particular in the appended claims. The improved method itself, however, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain presently preferred embodiments of the improved apparatus with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a partly schematic side elevational view of an apparatus which can be utilized for the practice of the improved method and embodies one presently preferred form of the invention; and FIG. 2 is an enlarged view of a detail in the apparatus of FIG. 1, showing the construction of the first conveyor and of the member which diverts successive pluralities of rod-shaped articles from the advancing means of the first conveyor toward the

concave surface of the intercepting member.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0033] FIG. 1 shows an apparatus which is used to convert a series of successive discrete elongated rod-shaped articles 1 into a continuous mass flow 2. Successive articles 1 of the series are advanced along a circular first path defined by an array of equidistant receptacles or advancing means 4 which orbit about the horizontal axis 18 of a rotary drum-shaped first conveyor 3 when the conveyor is driven to rotate in the direction of arrow A. The illustrated receptacles 4 are elongated flutes which are machined into or otherwise formed in the peripheral surface of the conveyor 3. The articles 1 are advanced sideways, i.e., transversely of their length, along the first path on the conveyor 3 as well during further transport toward and into the mass flow 2.

[0034] The flutes 4 advance successive articles 1 of the series of articles in the first path toward a transfer station 6 at which successive pluralities or groups of three articles 1a, 1b, 1c each are diverted into discrete (different or separate) second paths 8, 9 and 11, respectively. At least one of the three second paths 8, 9 and 11 is at least substantially tangential to the adjacent portion of the first path (extending along the peripheral surface of the conveyor 1).

[0035] The articles 1a to 1c of each successive plurality or group are diverted in part by at least one tongue-like diverting member 7 which extends into a circumferentially complete groove 33 in the peripheral surface of the conveyor 3. The articles 1 which advance at the transfer station 6 move along the adjacent slightly convex surface 19 of the diverting member 7 which prevents the articles from advancing beyond the second path 8 on their way toward the concave friction surface 13 which extends across at least one of the paths 8, 9, 11 and is provided on a stationary intercepting member 12. The illustrated intercepting member is connected to (e.g., of one piece with) the diverting member 7, and its concave surface 13 establishes a collecting chamber 14 which gathers the intercepted and decelerated articles 1 to form a supply of superimposed parallel articles.

[0036] The apparatus further comprises a second conveyor 16 including one or more endless flexible elements 17 (such as belts or chains) serving as a means for withdrawing from the supply of superimposed articles 1 in the chamber 14 an at least substantially continuous and uniform mass flow 2 for transport in the direction of arrow B. The mass flow 2 is advanced by the substantially horizontal upper reach or stretch 22 of the endless flexible element 17.

[0037] The level of the uppermost layer of parallel articles 1 in the mass flow 2 is monitored by a pivotable sensor lever or arm 27 which can generate signals or which can initiate the generation of signals serving to regulate the ratio of speeds of the conveyors 3 and 16

when the detected level departs from a desired optimum level. In addition to or in lieu of such function, the lever or arm 27 can serve as a means for smoothing the upper side of the mass flow 2 on the conveyor 16.

[0038] A further monitoring device 24 (e.g., a photoelectric detector) is installed adjacent a portion of the first path at the twelve o'clock position of the conveyor 3 to vary, at 26, the speed of a variable-speed prime mover 23 for the conveyor 16 when the frequency of advancement of successive articles 1 past the device 24 is too high or too low, for example, when the chamber 14 contains an excessive or an insufficient supply of parallel rod-shaped articles.

[0039] The path which is defined by the convex surface 19 of the diverting or deflecting member 7 merges gradually into the first path defined by the conveyor 3 as well as into the additional path which is defined by the concave surface 13 of the intercepting member 12.

[0040] It will be noted that, in the illustrated apparatus, the conveyor 3 is located at a first level, that the concave surface 13 is disposed at a second level below the first level, and that the mass flow 2 leaving the chamber 14 is located at a third level which is close to or coincides with the second level. The first path which is defined by the conveyor 3 slopes downwardly toward the transfer station 6, the second paths 8, 9 and 11 slope downwardly toward the concave surface 13, and the surface 13 slopes downwardly toward the level of the upper reach 22 of the endless flexible element 17 of the conveyor 16.

[0041] The aforescribed staggered transfer of pluralities of articles (1a, 1b, 1c) along different second paths 8, 9 and 11 ensures that the diverted articles 1 are spread out or fanned out into different portions of the chamber 14, i.e., into different portions of the supply of superimposed articles 1 in the chamber. Such mode of feeding articles into the chamber 14 ensures the formation of a homogeneous supply of articles upstream of the upper reach 22 of the element 17 so that the latter can draw a homogeneous mass flow 2 toward a processing station, e.g., into a filter tipping machine if the articles 1 are plain cigarettes, cigars or cigarillos or filter rod sections of unit length or multiple unit length.

[0042] The concave surface 13 is or can constitute a friction surface which reduces the kinetic energy of articles 1 coming in direct contact with the intercepting member 12. The concave surface 13 cooperates with the surface 19 and with the pneumatic system in the conveyor 3 to ensure that the diverted articles as well as the diverted, and intercepted articles penetrate into the lower strata of the articles which form the supply of superimposed parallel articles in the chamber 14. The height X^1 of the supply of articles 1 in the chamber 14 adjacent the concave surface 13 can equal or at least approximate the height X of the mass flow 2 on the upper reach 22 of the endless flexible element 17 forming part of the second conveyor 16. The articles (1c) advancing along the leftmost second path 11 are

directed into a loose zone within the chamber 14, namely into a zone to the left of the layers of articles (1a, 1b) which were caused to advance along the paths 8 and 9 directly along the concave surface 13. The loose zone in the chamber 14 can be said to constitute a wave hole and is desirable because this ensures the formation of a supply of parallel articles 1 having a height which is sufficient to enable the conveyor 16 to withdraw from the chamber 14 an at least substantially uniform or homogeneous mass flow 2 having the desired height X.

[0043] FIG. 2 illustrates the manner in which the conveyor 3 establishes several second paths 8, 9 and 11 which make oblique angles with each other, and the manner in which the conveyor 3 cooperates with the member 12 to ensure the aforesaid reduction of kinetic energy of articles 1 advancing toward and into the chamber 14. Each flute 4 of the conveyor 3 is provided with at least one suction port 21 which, in turn, communicates with one of three axially parallel channels 28 provided in the body of the conveyor 3. Each channel 28 extends to one end face of the conveyor 3 and communicates, during a predetermined part of each revolution of the conveyor 3, with one of three arcuate suction channels 29 provided in a stationary valve plate 31. The grooved or channeled side of the valve plate 31 is in sealing engagement with the adjacent end face of the conveyor 3.

[0044] Three successive suction ports 21a, 21b, 21c in the body of the conveyor 3 communicate with three different grooves 29a, 29b, 29c of the valve plate 31, at least while the articles 1 are caused to advance along that portion of their first path which is adjacent the transfer station 6. This ensures that the article 1c of each plurality or group of articles is no longer attracted to the surface bounding the respective flute 4 and advances along the path 11 while the articles 1b, 1c continue to be held in their flutes by suction, and that the article 1a of each plurality or group of articles continues to be attracted to the conveyor 3 while the preceding article 1b is already in the process of advancing along its path 9.

[0045] The valve plate 31 is further provided with staggered aerating holes or bores 32a, 32b, 32c which respectively admit air into the oncoming channels 28a, 28b, 28c to thus ensure that the articles 1a, 1b, 1c of successive pluralities or groups are no longer attracted to the conveyor 3 so that they are even more likely to enter the respective paths 8, 9 and 11, namely with assistance from centrifugal force.

[0046] The manner in which a rotary drum-shaped conveyor can pneumatically attract rod-shaped articles during advancement along an arcuate path is fully disclosed and shown, for example, in U.S. Pat. No. 3,664,891 granted May 23, 1972 to Schubert et al. for "Apparatus for assembling rows of rod-shaped articles". To the extent that it contributes to the understanding of the present invention, the disclosure of the patent to Schubert et al. is incorporated herein by reference.

[0047] The conveyor 3 can form part of or can receive rod-shaped articles from a cigarette rod making machine such as the cigarette maker known as PROTOS. Alternatively, the conveyor 3 can form part of or can receive rod-shaped articles from a filter tipping machine, e.g., a machine known as MAX, or from a filter rod making machine such as that known as KDF.

[0048] The conveyor 16 can deliver the mass flow 2 to a packing machine, e.g., a machine known as COMPAS, by way of a transfer system of the type known as RESY or of the type known as COMFLEX. Alternatively, the conveyor 16 can be utilized to deliver a mass flow of filter rod sections to a feeding system such as that known as FILTROMAT.

[0049] The aforementioned machines (PROTOS, MAX, KDF and COMPAS) as well as the aforementioned systems (RESY, COMFLEX and FILTROMAT) are distributed by the assignee of the present application.

[0050] An important advantage of the improved method and apparatus is that one can dispense with a top belt, such as that shown in U.S. Pat. No. 4,938,340, for reliable conversion of a single layer of spaced-apart discrete rod-shaped articles into a homogeneous mass flow. Furthermore, the improved apparatus is simple and compact and does not affect the quality of articles on their way from the conveyor 3 onto the conveyor 16. Still further, the concave surface 13 reduces the kinetic energy of oncoming articles to such an extent that the articles continue to move transversely of their length and form a stack of parallel articles in the chamber 14 at the receiving end of the upper reach 22 of the endless flexible element 17. Moreover, the speed of the conveyor 16 can be accurately synchronized with the speed of the conveyor 3 (to produce a mass flow 2 of desired height) in a simple and inexpensive but reliable manner.

[0051] The number of second paths can be reduced to less than three or increased to more than three without departing from the spirit of the invention.

[0052] Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of the above outlined contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the appended claims.

Claims

1. Apparatus for converting a series of discrete elongated rod-shaped articles (1) of the tobacco processing industry which are advanced by a rotary conveyor (3) into a mass flow (2) of superimposed layers of articles (1) which are transported by a second conveyor (16), characterised in that the rotary

- conveyor (3) is provided with equidistant receptacles (4) for advancement of successive discrete articles (1) transversely of their length along a first path toward a transfer station (6), by the provision of means (7, 21) for diverting successive pluralities of articles (1a, 1b, 1c) of the series of articles (1) arriving at the transfer station (6) into a plurality of different second paths (8, 9, 11), by the provision of means (12) for intercepting successive pluralities (1a, 1b, 1c) of diverted articles (1) including an at least partially concave surface (13) extending across at least one (8) of the second paths (8, 9, 11) and establishing a collecting chamber (14) wherein the intercepted articles (1) gather next to and are superimposed upon each other, and in that the second conveyor (16) comprises means (17, 22) for withdrawing from the chamber (14) an at least substantially continuous flow (2) of superimposed articles (1).
2. Apparatus according to Claim 1, characterised in that the rotary conveyor (3) is rotatable about an axis (18) which is at least substantially parallel to the articles (1) in the first path and in that the receptacles (4) circulate about the axis (18) of the rotary conveyor (3) along the first path in response to rotation of the rotary conveyor (3).
 3. Apparatus according to Claim 1 and/or 2, characterized in that the first path is a partly circular path and at least one of the different second paths (8, 9, 11) is substantially tangential to the partly circular first path.
 4. Apparatus according to at least one of Claims 1 to 3, characterised in that the diverting means (7, 21) includes means (19, 21) for expelling successive pluralities (1a, 1b, 1c) of articles (1) from the first path into the plurality of different second paths (8, 9, 11).
 5. Apparatus according to Claim 4, characterised in that the diverting means (7, 21) includes a portion (7, 19) which is connected with the intercepting means (12).
 6. Apparatus according to one or more preceding Claims, characterised in that the diverting means (7, 21) includes a convex surface (19) merging into the at least partially concave surface (13).
 7. Apparatus according to one or more preceding Claims, characterised in that the diverting means (7, 21) includes means (21) for pneumatically attracting the articles (1) of the series of articles to the receptacles (4) only along the first path.
 8. Apparatus according to Claim 7, characterised in that the means (21, 29) for pneumatically attracting the articles (1) includes suction ports (21a, 21b, 21c) provided in the receptacles (4) and means (29a, 29b, 29c) for withdrawing air from the ports (21a, 21b, 21c) during different stages of advancement of successive articles (1a, 1b, 1c) along the first path so that each article (1) of a plurality of articles (1a, 1b, 1c) is released into the respective second path (8, 9, 11) from a different portion of the first path.
 9. Apparatus according to one or more preceding Claims, characterised in that the rotary conveyor (3) is disposed at a first level, in that the collecting chamber (14) is disposed at a second level beneath the first level, and in that the withdrawing means (17, 22) is disposed at a third level at least close to the second level.
 10. Apparatus according to one or more preceding Claims, characterised by the provision of a variable-speed prime mover (23) for the second conveyor (16), by the provision of means (24) for monitoring the frequency of advancement of successive articles (1) of the series along a portion of the first path, and by the provision of means (26) for varying the speed of the prime mover (23) as a function of the monitored frequency.
 11. Apparatus according to one or more preceding Claims, characterised in that the at least partially concave surface (13) is a friction surface which decelerates at least one article (1a) of each plurality of articles (1a, 1b, 1c) on their way into the collecting chamber (14).
 12. Apparatus according to one or more preceding Claims, characterised by the provision of means (27) for monitoring the height (X) of the flow (2) on the second conveyor (16).
 13. Apparatus according to one or more preceding Claims, characterised in that the rotary conveyor (3) has a convex peripheral surface extending along the first path and in that the diverting means (7, 21) has a surface (19) disposed at the transfer station (6) and establishing for successive pluralities (1a, 1b, 1c) of articles (1) a further path merging gradually into the first path and into a path defined by the at least partially concave surface (13).
 14. Apparatus according to one or more preceding Claims, characterised in that the receptacles (4) of the rotary conveyor (3) communicate with suction ports (21) provided in the rotary conveyor (3).
 15. A method of converting a series of successive discrete elongated rod-shaped articles (1) of the

- tobacco processing industry into a mass flow (2) of superimposed articles (1), characterised by advancing successive articles (1) of the series transversely of their length by a rotary conveyor (3) along a first path toward a transfer station (6), by diverting successive pluralities (1a, 1b, 1c) of articles (1) of the series from the first path into a plurality of different second paths (8, 9, 11), by intercepting successive pluralities (1a, 1b, 1c) of diverted articles (1) including positioning an at least partially concave surface (13) across at least one (8) of the second paths (8, 9, 11), by gathering the intercepted articles (1) into a supply (in 14) of superimposed articles (1), and by drawing (by 16) a continuous mass flow (2) of superimposed articles (1) from the supply (in 14).
16. Method according to Claim 15, characterised in that the first path includes a substantially circular portion and in that at least one of the plurality of different second paths (8, 9, 11) is at least substantially tangential to the circular portion of the first path.
17. Method according to Claim 15 or 16, characterised in that the second paths (8, 9, 11) are oriented to deliver articles (1) to different portions of the supply (in 14) of superimposed articles (1).
18. Method according to one or more Claims 15 to 17, characterised in that the at least partially concave surface (13) is configured and positioned to reduce the kinetic energy of at least some (1a) of the articles (1a, 1b, 1c) arriving along the second paths (8, 9, 11) as a result of frictional engagement between the at least partially concave surface (13) and the articles (1a).
19. Method according to one or more Claims 15 to 18, characterised in that the rod-shaped articles (1) are plain or filter cigarettes, cigars or cigarillos and/or filter rod sections.
20. Method according to one or more Claims 15 to 19, characterised in that the first path slopes downwardly at the transfer station (6), that the second paths (8, 9, 11) slope downwardly toward the at least partially concave surface (13), and in that the at least partially concave surface (13) slopes downwardly toward the supply (in 14) of superimposed articles (1).
- Patentansprüche**
1. Vorrichtung zum Fördern einer Serie von einzelnen, länglichen und stabförmigen Gegenständen (1) der Tabakverarbeitenden Industrie, die mittels eines drehbaren Förderers (3) in einen Mengenstrom (2) aus übereinanderliegenden Schichten von Gegenständen (1) bewegt und die mittels eines zweiten Förderers (16) transportiert werden, dadurch gekennzeichnet, dass der drehbare Förderer (3) in gleichen Abständen Fächer (4) aufweist, um nacheinander angeordnete einzelne Gegenstände (1) quer zu ihrer Länge entlang eines ersten Weges gegen eine Uebergabestation (6) zu bewegen, mit Mitteln (7,21) zum Umlenken aufeinanderfolgender Mengen von Gegenständen (1a, 1b, 1c) einer Serie von Gegenständen (1), die bei einer Uebergabestation (6) in einer Mehrzahl von unterschiedlichen zweiten Wegen (8, 9, 11) ankommen, mit Mitteln (12) zum Abscheiden aufeinanderfolgender Mengen (1a, 1b, 1c) umgelenkter Gegenstände (1), die eine wenigstens bereichsweise konkave Fläche (13) aufweisen, die sich entlang wenigstens eines (8) der zweiten Wege (8, 9, 11) erstreckt und eine Sammelkammer (14) bildet, wobei die abgeschiedenen Gegenstände (1) beieinander und übereinander angeordnet sind, und dass der zweite Förderer (16) Mittel (17, 22) aufweist, um aus der Sammelkammer (14) einen im wesentlichen kontinuierlichen Fluss (2) aus übereinander angeordneten Gegenständen (1) zu entnehmen.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der drehbare Förderer (3) um eine Achse (18) drehbar ist, die im wesentlichen parallel ist zu den Gegenständen (1) des ersten Weges und dass die Fächer (4) aufgrund der Drehung des drehbaren Förderers (3) sich entlang eines ersten Weges um die Achse (18) des drehbaren Förderers (3) bewegen.
3. Vorrichtung nach Anspruch 1 und/oder 2, dadurch gekennzeichnet, dass der erste Weg teilweise kreisförmig ist und dass wenigstens einer der unterschiedlichen zweiten Wege (8, 9, 11) im wesentlichen tangential ist zum teilweise kreisförmigen ersten Weg.
4. Vorrichtung nach wenigstens einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, dass die Umlenkmittel (7, 21) Mittel (19, 21) aufweisen, um aufeinanderfolgende Mengen (1a, 1b, 1c) von Gegenständen (1) vom ersten Weg in die mehreren unterschiedlichen zweiten Wege (8, 9, 11) abzulenken.
5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, dass die Umlenkmittel (7, 21) einen Teil (7,19) aufweisen, welcher mit den abscheidenden Mitteln (12) verbunden ist.
6. Vorrichtung nach einem oder mehreren der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass die Umlenkmittel (7, 21) eine konvexe Fläche (19) aufweisen, welche an die wenigstens teilweise

konkave Fläche (13) anschliesst.

7. Vorrichtung nach einem oder mehreren der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass die Umlenkmittel (7, 21) Mittel (21) aufweisen, um die Gegenstände (1) der Serie der Gegenstände ausschliesslich entlang des ersten Weges pneumatisch an die Fächer (4) anzuziehen. 5
8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, dass die Mittel zum pneumatischen Anziehen der Gegenstände (1) Saugöffnungen (21a, 21b, 21c) aufweisen, die in den Fächern (4) angeordnet sind, und Mittel (29a, 29b, 29c) vorgesehen sind, um während unterschiedlichen Bewegungsabschnitten aufeinander folgender Artikel (1a, 1b, 1c) entlang des ersten Weges Luft aus den Saugöffnungen abzusaugen, sodass jeder Artikel (1) einer Mehrzahl von Artikeln (1a, 1b, 1c) aus unterschiedlichen Abschnitten des ersten Weges in einen entsprechenden zweiten Weg (8, 9, 11) freigegeben wird. 10 15 20
9. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der drehbare Förderer (1) auf einem ersten Niveau angeordnet ist, dass die Sammelkammer (14) auf einen zweiten Niveau unterhalb des ersten Niveaus angeordnet ist und dass die Abtransportmittel (17, 22) auf einen dritten Niveau wenigstens nahe des zweiten Niveaus angeordnet sind. 25 30
10. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass für den zweiten Förderer (16) ein geschwindigkeitsvariabler erster Antrieb (23) vorgesehen ist, dass Mittel (24) zum Überwachen der Förderfrequenz aufeinander folgender Gegenstände (1) der Serie entlang eines Abschnittes des ersten Weges und dass Mittel (26) vorgesehen sind, um die Geschwindigkeit des ersten Antriebs (23) als eine Funktion der überwachten Frequenz zu ändern. 35 40
11. Vorrichtung nach einem oder mehreren der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass die wenigstens bereichsweise konkave Fläche (13) eine Reibungsfläche ist, welche wenigstens einen Gegenstand (1a) jeder Gegenstandsmenge (1a, 1b, 1c) auf seinem Weg in die Sammelkammer (14) bremst. 45
12. Vorrichtung nach einem oder mehreren der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass Mittel (27) vorgesehen sind, um die Höhe (X) des Flusses (2) auf dem zweiten Förderer (16) zu überprüfen. 50 55
13. Vorrichtung nach einem oder mehreren der voraus-

gehenden Ansprüche, dadurch gekennzeichnet, dass der drehbare Förderer (3) eine konvexe periphere Fläche aufweist, die sich entlang des ersten Weges erstreckt und dass die Umlenkmittel (7, 21) eine Fläche (19) aufweisen, die bei der Uebergabestation (6) angeordnet ist und die für aufeinanderfolgende Mengen (1a, 1b, 1c) von Gegenständen (1) einen weiteren Weg bilden der allmählich in den ersten Weg und in einen Weg übergeht, der durch die wenigstens teilweise konkave Fläche (13) gebildet wird.

14. Vorrichtung nach einem oder mehreren der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass die Fächer (4) des drehbaren Förderers (3) mit den Saugöffnungen verbunden sind, welchen im drehbaren Förder (3) angeordnet sind.
15. Verfahren zum Fördern einer Serie aufeinander folgender einzelner und stabförmiger Gegenstände (1) der Tabakverarbeitenden Industrie in einen Mengenstrom (2) aus übereinander liegender Gegenstände (1), dadurch gekennzeichnet, dass aufeinander folgende Gegenstände (1) der Serie quer zu ihrer Länge mit einem drehbaren Förderer (3) entlang eines ersten Weges gegen eine Uebergabestation (6) bewegt werden, dass aufeinander folgende Mengen (1a, 1b, 1c) von Gegenständen (1) der Serie von einem ersten Weg in eine Mehrzahl von unterschiedlichen zweiten Wegen (8, 9, 11) umgelenkt werden, dass aufeinander folgende Mengen (1a, 1b, 1c) der umgelenkten Gegenstände (1) an wenigstens einer teilweise konkaven Fläche (13) entlang wenigstens eines (8) der zweiten Wege (8, 9, 11) abgeschieden werden, wobei die abgeschiedenen Gegenstände (1) zu einem Zufluss (bei 14) von übereinander angeordneten Gegenständen (1) gesammelt werden, und wobei ein kontinuierlicher Mengenstrom (2) von übereinander angeordneten Artikeln (1) vom Zufluss (bei 14) abgezogen wird.
16. Verfahren nach Anspruch 15, dadurch gekennzeichnet, dass der erste Weg einen im wesentlichen kreisförmigen Bereich aufweist und dass wenigstens einer der mehreren unterschiedlichen zweiten Wege (8, 9, 11) im wesentlichen tangential zum kreisförmigen Bereich des ersten Weges ist.
17. Verfahren nach Anspruch 15 oder 16, dadurch gekennzeichnet, dass die zweiten Wege (8, 9, 11) so ausgerichtet sind, dass Gegenstände (1) zu unterschiedlichen Bereichen des Zuflusses (bei 14) aus übereinander angeordneten Gegenständen (1) abgegeben werden.
18. Verfahren nach einem oder mehreren der Ansprüche 15 bis 17, dadurch gekennzeichnet, dass die

wenigstens bereichsweise konkave Fläche (13) so ausgebildet und angeordnet ist, dass die kinetische Energie wenigstens einiger (1a) der Gegenstände (1a, 1b, 1c) als Resultat einer Reibung zwischen der wenigstens bereichsweise konkaven Fläche (13) und der Gegenstände (1a) entlang der zweiten Wege (8, 9, 11) reduziert ist.

19. Verfahren nach einem oder mehreren der Ansprüche 15 bis 18, dadurch gekennzeichnet, dass die stabförmigen Gegenstände (1) filterlose Zigaretten oder Filterzigaretten, Zigarren oder Zigarillos und/oder Filterstababschnitte sind.

20. Verfahren nach einem oder mehreren der Ansprüche 15 bis 19, dadurch gekennzeichnet, dass der erste Weg bei der Uebergabestation (6) nach unten geneigt ist, dass die zweiten Wege (8, 9, 11) nach unten gegen die wenigstens bereichsweise konkave Fläche (13) geneigt sind, und dass die wenigstens bereichsweise konkave Fläche (13) nach unten gegen den Zufluss (bei 14) der übereinander angeordneten Artikel (1) geneigt ist.

Revendications

1. Dispositif pour convertir une série d'articles allongés séparés en forme de tiges (1) de l'industrie de transformation du tabac, qu'un transporteur rotatif (3) fait avancer, en un flux massique (2) de couches superposées d'articles (1), qui sont transportées par un second transporteur (16), caractérisé en ce que le transporteur rotatif (3) comporte des réceptacles équidistants (4) pour faire avancer des articles séparés successifs (1) dans une direction transversale à leur longueur, le long d'un premier trajet dirigé vers un poste de transfert (6), en ce qu'il est prévu des moyens (7, 21) pour dévier des ensembles successifs d'articles (1a, 1b, 1c) de la série d'articles (1), arrivant au poste de transfert (6), sur une pluralité de seconds trajets différents (8, 9, 11), en ce qu'il est prévu des moyens (12) pour intercepter des ensembles successifs (1a, 1b, 1c) d'articles déviés (1), comprenant une surface au moins partiellement concave (13) s'étendant en travers d'au moins l'un (8) des seconds trajets (8, 9, 11) et établissant une chambre collectrice (14), dans laquelle les articles interceptés (1) se regroupent les uns avec les autres et sont superposés les uns aux autres, et en ce que le second transporteur (16) comprend des moyens (17, 22) pour extraire de la chambre (14) un flux au moins sensiblement continu (2) d'articles superposés (1).

2. Dispositif selon la revendication 1, caractérisé en ce que le transporteur rotatif (3) peut tourner autour d'un axe (18) qui est parallèle, au moins sensiblement, aux articles (1) situés dans le premier trajet

et en ce que les réceptacles (4) circulent autour de l'axe (18) du transporteur rotatif (3) le long du premier trajet suite à la rotation du transporteur rotatif (3).

3. Dispositif selon la revendication 1 et/ou 2, caractérisé en ce que le premier trajet est un trajet partiellement circulaire et l'un au moins des seconds trajets différents (8, 9, 11) est sensiblement tangent au premier trajet partiellement circulaire.

4. Dispositif selon au moins l'une des revendications 1 à 3, caractérisé en ce que les moyens de déviation (7, 21) comprennent des moyens (19, 21) pour éjecter des ensembles successifs (1a, 1b, 1c) d'articles (1) du premier trajet pour les introduire dans la pluralité de seconds trajets différents (8, 9, 11).

5. Dispositif selon la revendication 4, caractérisé en ce que les moyens de déviation (7, 21) comprennent une partie (7, 19) qui est raccordée aux moyens d'interception (12).

6. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que les moyens de déviation (7, 21) comprennent une surface convexe (19) qui se prolonge par la surface au moins partiellement concave (13).

7. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que les moyens de déviation (7, 21) comprennent des moyens (21) pour réaliser une attraction pneumatique des articles (1) de la série d'articles sur les réceptacles (4), uniquement le long du premier trajet.

8. Dispositif selon la revendication 7, caractérisé en ce que les moyens (21, 29) d'attraction pneumatique des articles (1) comprennent des orifices d'aspiration (21a, 21b, 21c) prévus dans les réceptacles (4) et des moyens (29a, 29b, 29c) pour extraire de l'air des orifices (21a, 21b, 21c) pendant des phases d'avance différentes d'articles successifs (1a, 1b, 1c) le long du premier trajet, de sorte que chaque article (1) d'un ensemble d'articles (1a, 1b, 1c) est libéré dans le second trajet respectif (8, 9, 11) depuis une partie différente du premier trajet.

9. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que le transporteur rotatif (3) est disposé à un premier niveau, en ce que la chambre collectrice (14) est disposée à un second niveau en dessous du premier niveau et en ce que les moyens d'extraction (17, 22) sont disposés à un troisième niveau, au moins proche du second niveau.

10. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'il est prévu une machine motrice (23) à vitesse variable pour le second transporteur (16), en ce qu'il est prévu des moyens (24) pour contrôler la fréquence d'avance d'articles successifs (1) de la série le long d'une partie du premier trajet, et en ce qu'il est prévu des moyens (26) pour modifier la vitesse de la machine motrice (23) en fonction de la fréquence contrôlée.
11. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que la surface au moins partiellement concave (13) est une surface de friction qui décélère au moins un article (1a) de chaque ensemble d'articles (1a, 1b, 1c) sur le trajet qui les mène dans la chambre collectrice (14).
12. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'il est prévu des moyens (27) pour contrôler la hauteur (X) du flux (2) sur le second transporteur (16).
13. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que le transporteur rotatif (3) possède une surface périphérique convexe, qui s'étend le long du premier trajet, et en ce que les moyens de déviation (7, 21) possèdent une surface (19) disposée au poste de transfert (6) et établissant, pour des ensembles successifs (1a, 1b, 1c) d'articles (1) un trajet supplémentaire qui rejoint progressivement le premier trajet et un trajet défini par la surface au moins partiellement concave (13).
14. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que les réceptacles (4) du transporteur rotatif (3) communiquent avec des orifices d'aspiration (21) prévus dans le transporteur rotatif (3).
15. Procédé pour convertir une série d'articles successifs allongés séparés en forme de tiges (1) de l'industrie de transformation du tabac, en un flux massique (2) d'articles superposés (1), caractérisé par l'avancement des articles successifs (1) de la série dans une direction transversale à leur longueur au moyen d'un transporteur rotatif (3), le long d'un premier trajet dirigé vers un poste de transfert (6), par la déviation des ensembles successifs (1a, 1b, 1c) d'articles (1) de la série du premier trajet sur une pluralité de seconds trajets différents (8, 9, 11) par l'interception d'ensembles successifs (1a, 1b, 1c) d'articles déviés (1) faisant intervenir le positionnement d'une surface au moins partiellement concave (13) en travers d'au moins l'un (8) des seconds trajets (8, 9, 11), par le regroupement des articles interceptés (1) en une réserve (en 14) d'articles superposés (1), et par l'extraction (en 16) d'un flux massique continu (2) d'articles superposés (1) de la réserve (en 14).
16. Procédé selon la revendication 15, caractérisé en ce que le premier trajet comprend une partie essentiellement circulaire et en ce qu'au moins l'un des seconds trajets différents (8, 9, 11) est au moins sensiblement tangent à la partie circulaire du premier trajet.
17. Procédé selon la revendication 15 ou 16, caractérisé en ce que les seconds trajets (8, 9, 11) sont orientés de manière à délivrer des articles (1) à des parties différentes de la réserve (en 14) d'articles superposés (1).
18. Procédé selon une ou plusieurs des revendications 15 à 17, caractérisé en ce que la surface au moins partiellement concave (13) est configurée et positionnée de manière à réduire l'énergie cinétique d'au moins certains (1a) des articles (1a, 1b, 1c) arrivant le long des seconds trajets (8, 9, 11), par suite d'un contact avec friction entre la surface au moins partiellement concave (13) et les articles (1a).
19. Procédé selon une ou plusieurs des revendications 15 à 18, caractérisé en ce que les articles en forme de tiges (1) sont des cigarettes sans filtre ou avec filtre, des cigares ou des cigarillos et/ou des tronçons de tiges de filtre.
20. Procédé selon une ou plusieurs des revendications 15 à 19, caractérisé en ce que le premier trajet s'incline vers le bas au poste de transfert (6), en ce que les seconds trajets (8, 9, 11) s'inclinent vers le bas en direction de la surface au moins partiellement concave (13) et en ce que la surface au moins partiellement concave (13) s'incline vers le bas en direction de la réserve (en 14) d'articles superposés (1).



